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Teaching aircraft identification.

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TEACHING AIRCRAFT IDENTIFICATION

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TEACHING AIRCRAFT IDENTIFICATION

By HAROLD E. LYNCH

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INTRODUCTION

The author of this study was an officer in the United States Army Air Corps for more than a year and a half. These months were spent in continuous service as an instructor in a ground school of the Army Training Command, teaching airplane identification.

The importance of this subject in the training of men who wage war in the air will be covered in its proper place in this study. The evidence of that importance will be offered of necessity only by the stated experience of the writer, and the observations, summaries, analyses, and criticisms found here are his undocumented possession since no one may take or quote actual restricted material of the United States Army.

However, the process of learning to identify planes as taught by the Army and as analyzed or criticized or approved here is decidedly valuable as shown by the experiences of the men who after training, fly the planes over the battlefields of the world.

The writer believes that he is in a position to express himself on the validity and effectiveness of this portion of a flyer's training with assurance and a fairly high degree of

accuracy. During the time of the writer's service in airplane identification training, hundreds of men passed through his classes alone.

It is hoped that the plan of training and the speed of accomplishment set forth in this special field may have values for other types of subject matter learning and to that end the writer has offered suggestions of application, at the conclusion of the discussions of each type of aid, to teaching airplane identification considered in this study.

IMPORTANCE OF IDENTIFICATION

Teaching Aircraft Identification in the Army Air Force Training Command is one of the most interesting assignments that can be given to an officer in the training command. Identification is the best and most effective weapon a fighting nation has, and at the same time it is a potent, though intangible, offensive weapon. Knowing whether a plane is a friend or enemy and having this information soon enough to give one time to shoot, or formulate an attack is one of the fundamentals of modern warfare. We are all familiar with many costly mistakes that have been made all over the world in shooting down friendly planes including our own and in allowing enemy planes to fly in for the kill. The mission of the Training Command is to cut down, and to eliminate, if possible, these mistakes. In the Army Air Force Training Command Air-Craft Identification plays a major role in so far as subject matter is concerned, for the aviation cadet found this particular course a "must" on the list of his academic requirements. Our course was of thirty hours duration made up of the study of forty-five planes: American, English, German, and Japanese. Classes averaged seventy-five cadets each.

It was early recognized that in so far as the Air Corps was concerned absolute identification of air-craft at a distance was essential. For example, mistaken identity has been the cause of Mustangs P-51's being shot down as they were thought to be German 109's. In this case it is extremely difficult to recognize either plane at a distance until a glimpse of the wing tips of the Mustang can be had. The spinner of both planes appears to be the same; wing position on the fuselage is identical. It is only through training in air-craft identification that a pilot or gunner realizes that the 109 has a larger nose, round wing tips, and a shorter vertical fin and rudder, while the Mustang has a thicker throat, shorter nose, square wing tips, and squared-off fin and rudder. Even though these differences are very apparent to the observer on the ground, when flying three hundred ninety miles per hour, they appear to him to be the same plane.

The P-47 Thunderbolt and the German 190 also have characteristics that tend to confuse the observer, and here again it is size and wing shape that are the clues. The Thunderbolt has a perfectly elliptical wing and a distinctive heart-shaped fin and rudder that gives it away quickly. But the resemblance between the two planes is close enough to be troublesome.

Early in the war in the African theater of operation C-47 two-engine transport planes were shot down by Americans flying P-47's. Ironically enough, the C-47's were carrying engines for P-40's. In this particular case it was lack of recognition

of American planes that brought about this sad mistake. Here again was proof that a course in air-craft identification was needed.

In the Southwest Pacific theater the Jap zero and P-40 Warhawk were very confusing. American pilots, though knowing their own planes, continually flew near the Zero until it was too late. The Jap plane has a better rate of climb and could get on top for a kill.

These are only a few incidents and many more could be told but it is not very discreet to do so. The writer was an instructor in air-craft identification in the ground school at Maxwell Field, Alabama, part of the Eastern Flying Training Command, and as a result had direct access to information brought by men fresh from combat. To a man they all reported that intensive study was needed in air-craft identification.

In the various theaters of operations it must be understood that intelligence always reports the types of plane that probably will be met.

SILHOUETTE INSTRUCTION

Pre-Pearl Harbor standards took the view that if a man knew enough to fly a plane, he certainly was able to recognize and identify any other plane within the scope of his vision. Evidently this was an unsound assumption because shortly after December 7, 1941, reports began coming in of so-called mistakes in recognizing enemy planes or of failure to recognize friendly planes. English reports also gave information that English planes were being shot down by English pilots and by the fire of English anti-aircraft guns. The resulting losses of planes and crews soon brought a decree from Washington demanding that something be done in the training of men to cut down such mistakes. The result was the development of a course in air-craft identification.

Cuts of all types of planes were prepared to show each plane in three views as silhouettes. These were each one and one half inches long and were printed so that the three silhouettes of any type plane made a row across a sheet of notebook paper. Ten such rows filled the sheet, thus offering ten types of planes on one sheet for study. The three views were:

- (1) Plane coming head-on toward the reader,
- (2) Side view

of the plane, and (3) Plan-view showing shape of the wings and fuselage.

With students all provided with these identification sheets, the instructor proceeded to explain each type of plane illustrated on the sheet in hand, starting with the head-on view. This view presents to the cadet the nose of the plane, the position of the wing and the tail assembly. The instructor explained the shape of the nose by comparing it to an egg, pear, or apple. The reason for this type of explanation is that the nose of any plane may be round, or elliptical because of the shape of the canopy or greenhouse. It may be wider at the bottom due to air scoop and narrow at the top. The instructor always emphasized this view because it is extremely hard to identify. The "gadgets" gazed long and hard at trying to place in their minds the wing position, shape of nose, and tail assembly.

Following the head-on view, the side-view was taken up. Even though the silhouette was only one and one half inches in length this view was rather easy. The "gadget" here was able to see the shape of the spinner, and from that he could automatically tell whether the engine was in line or radial. The fuselage with "greenhouse" presented a picture of a lean, sleek plane or a short, stubby one. The shape of the fin and rudder was distinct and clear. The side-view presented all of the outstanding characteristics of planes and as a result was the easiest view of all to recognize.

The plan-view was taken up last. The only feature that was stressed here was the shape of the wings and horizontal

tail plane. This type of presentation continued for twenty-five hours with the cadets gazing at one and one half inch silhouettes and was continued through primary basic and advanced. During the class period, large posters of the planes would be passed through the room, the instructor would give details as to wing span, horse-power, shape of wings, position of the wing, and shape of engine nacelles. Constant repetition of the features of the planes drove home the many characteristics with the result that the cadet was soon able to give a picture of any plane.

This type of visual instruction continued for some months. It was a help but a very meager help to prospective aviators. They could not in any way get a real perspective as to size of the plane and over-all appearance. This over-all appearance was always mentioned. Let the reader of this paper try to get an over-all appearance of any object from a group of silhouettes measuring one and one half inches in length. Again remember that nine other planes with three silhouettes each were on the same paper, making a total of thirty views of ten planes on one paper. Cadets continually complained that the views all looked alike, which was true because the single engine planes were all together on the one paper; another paper would contain two-engine planes; and the last four-engine planes. The examination consisted of several pages of silhouettes with actual photographs of planes of various types to be identified.

This phase of instruction was of little help because a true picture of the plane could not be had. During the twenty-

five hours course, lectures had to be given in the nomenclature, purpose, and missions of the planes. With this particular type of instruction no attempt was made to have the cadets remember wing spans, and the advice given was to fire at planes that turned toward your plane. With this advice the 8th Air Force in England continually tried to combat the downing of American planes by American fliers. On one occasion a formation of B-17's and 47's knew of the time and rendezvous; nevertheless when the 47's showed up, they were met with a concentrated fire from the 17's and had to go back. So we find that even though airmen knew planes of that type were coming, as soon as the nose of the plane turned toward the bombers, it was met with 50 calibre fire.

It was becoming obvious that silhouette training was of little value. The student was handicapped because he could not get a clear image of the plane and the instructor wondered just what it was all about, but the directive stated that aircraft identification had to be taught that way so, that way was followed.

At this point higher authority realized that all was not well with the methods of air-craft identification, and as a result, scaled models of wood were introduced. So, step number two was class instruction with wooden models painted black.

USE OF SILHOUETTES IN PUBLIC SCHOOLS

Silhouettes have been used to only a slight extent in elementary or secondary education. One fertile field for experimentation in the use of silhouettes is in respect to the study of areas as compared with perimeters. One of the most unfortunate misunderstandings in the minds of many pupils is the confusion between the length of the boundary of an area and its actual area. One reason for such confusion is that in the usual textbook diagram and blackboard drawing, the boundary is emphasized rather than the area. Silhouettes could well be used to develop basic concepts of area, such as the ability to estimate whether two areas of different shapes are approximately equal, the ability to estimate changes in area as dimensions are proportionally increased, and the ability to judge similarity. Short exposures of area silhouettes could be used to raise these needed skills and perceptions to a sufficient efficiency to insure their proper functioning in computation and the solution of problems.

MODELS

After discarding the silhouettes, the Air Corps used wooden models purchased by the government or contributed by high schools all over the country, and a different type of instruction, a slower presentation, was carried on. Here the cadets could actually see a scaled model of any type of plane and get a somewhat better idea of it. The instructor in charge of the class paraded back and forth, calling attention to some specific detail of construction, such as wing construction, position of wing, location of engine nacelle, and tail assembly. The instructor would necessarily have to fill in the class period with what was called "soap". In reading intelligence reports, the officer would pick up interesting facts concerning the plane in question and relay them to the cadets. Needless to say, for the cadets this was the most interesting part of the hour. When working with silhouettes, the cadet at least had something in front of him; his attention was always on his own paper, and by concentrating, he could memorize certain details of the silhouettes; but with the models, he had to follow the plane in the instructor's hand as the instructor walked up and down

through the classroom. Another drawback was the fact that the fighter planes were small, two engine planes were slightly larger, and the heavy bomber was quite large, so immediately the cadet would group the planes in three classes. Also he saw the same identical plane nearly every day, so here again memory played a great role. While giving an examination, the instructor naturally had to display the wooden models, holding them in view and then hiding them. This method was combined with display of posters along the wall, and between seeing the model and looking at the posters, the student usually called the plane right the first time.

Although the cadets scored high in the exams, they still made serious mistakes when it came to actual identification in flight and it was therefore evident no great progress had been made. Aviation cadets were not allowed to go on the flight line and as a result could not actually see many of the American planes that were presented. The Training Command continuously sought a method that would allow an instructor to repeat presentations to students daily. Trained observers were needed that could recognize planes at a distance of at least 1000 yards, because at that distance German planes open fire. As a result early in 1943 the flash method came into being and the remainder of this section will attempt to explain the so-called "flash" system.

USE OF MODELS IN PUBLIC SCHOOLS

The use of large-scale models of complex instruments, pioneered by the Army and Navy in the teaching of navigation instruments and computers, suggests that the teaching time may be shortened and the efficiency of learning increased by such a procedure in many fields of secondary education.

The large scale slide rule is a familiar use of models, but equal success will probably result from the use of large models of micrometers, calipers, verniers and similar complex instruments used in vocational education. The average shop does not possess sufficient instruments of this sort to make class instruction possible, so that time consuming individual instruction is necessary or text-book diagrams and complicated verbal instructions must be utilized. The large scale model not merely eliminates verbal difficulties that result from a study of text-book directions, but serve to arouse interest and motivate the learning of the operation of the device.

In elementary mathematics, such diverse topics as the telling of time in grades 1 and 2, and the reading of gas and electric meters in grades 7 and 8, would be considerably facilitated

by large-scale models possessing the essential characteristics of the dials of the actual instruments. Thus, a large-scale clock, with hour and minute hand synchronized eliminates the eyestrain and confusion involved in learning to read time from an actual clock and makes unnecessary tedious and time consuming blackboard drawings.

Even such a simple objective as learning to use a protractor could advantageously employ a large-scale protractor, similar in essential details to the one used by the pupil, but large enough to eliminate eyestrain and verbal difficulties involved in making explanations with an actual protractor.

The use of models has long been customary in solid geometry, where many of the diagrams are exceedingly difficult for some pupils to visualize, especially those pupils with little practice in three dimensional drawing. Elaborate and costly sets of models have been available, but their use is not widespread. Many teachers object to the use of these models as being a "crutch," that is, they make unnecessary the use of mental visualization and create a dependence on models throughout the course. Some teachers find that this criticism is not justified if definite provisions are made to use the models of lines, planes, etc. to develop the ability to visualize in three dimensions, rather than to avoid such visualization.

In learning to read blueprints, many pupils are required to draw three-view drawings by studying an isometric sketch of a machine part. This procedure has the disadvantage of basing the work on the ability to understand pictorial re-

presentation. Better progress would probably be made if large models of machine parts were available and pupils were taught to draw the three views by examining the actual model. Later, practice in visualization could come from the drawing of isometric sketches both from actual models and from three-view sketches.

If technology permitted, the use of large transparent models to illustrate the treatment of invisible lines in drafting could be used. Probably a series of such models could well be used as a syllabus for an introduction to blueprint reading and drafting. Models of all kinds have long been used in biology and physics with excellent results.

FLASH SYSTEM

It may be of interest to the reader to know of the physical conditions under which the flash system was taught. The room held ninety-six cadets crowded together in an arm-chair type of seat. A few of the rooms had six windows but many had only three such windows. The windows made no difference as the shades were always drawn and doors closed. Since this ground school was in the deep south and all doors closed, the temperature varied from 80°--120°F. Though this condition existed for over two years, it was only in July of 1944 that fans were placed in the rooms for ventilation which did little to relieve the stuffy condition. Many times classes started at 6 A.M. when cadets were still sleepy, so the lessons many times were wasted. Classes also started immediately after lunch, which made them listless and sleepy. Cadets had to be seated in a military manner and a fixed position did nothing to relieve their tired feelings. Following the good old army custom of standardized procedure, it was amusing to go into the area and hear ten officers of the ground school say the same thing at the same time. Every lesson plan was timed so the various instructors presented the same plane

as their next door neighbor at exactly the same time, so all classes received the same material at the same time. Here we find that the instructors were merely canned records, with no chance to deviate from a set routine of presentation. They were told what to say, when to say it and how to say it. These so-called "poop" sheets were handed to real estate men, lawyers, post and office workers, teachers from small southern towns and instructors from the north or anybody available who would accept this kind of work. In other words, it made no difference whether a man was a good teacher or not, the army classification officer said this man was to teach and so he became an instructor. Many talked in such low tones that cadets could not hear them; others, they could not understand as they instructed and as a result these instructors were reclassified. The reclassification took a period of six months, so classes suffered. Instructors were rated every week by air inspectors from the Inspector-General's office and a low rating meant a transfer. The time element was such that classes would be subjected to poor instruction for long periods of time before a correction was made. Throughout the command, officers taught anywhere from two to five classes a day and at Maxwell Field the quota for an instructor was five classes a day, six days a week. There could be no so-called "goofing" off in classes because of the fear of air-inspectors. Examinations were held every tenth, twentieth and thirtieth hour with the first two exams carrying a weight of fifty per cent and the final one also fifty per cent. If a cadet failed in

the final examination, he would be given a makeup exam. If his mark then was above 70% he would pass and not be washed out.

The main stand-by of the recognition department of the ground school early in 1943 resolved itself into use of the projector with a time shutter, to control the length of exposure. The slides used measured two by two and one-half inches, the image was one inch in length. The screen was a white beaded affair that was on a roller in the front of the room.

A projector with a shutter that timed exposures from one second to 1/100 of a second with slides of all planes in all positions made up the tools with which we worked plus the so-called "poop" sheets that give all information needed. Instructors drew slides and projector for class work, pulled down shades, tested machine, and were ready to begin the class exercise. The classes came in by flights with flight officer in charge who gave attendance report and as the bell sounded, the class was ready to begin.

The first hour was taken up by the instructor explaining the scope of the course, length of course, nomenclature, and parts of the plane. After the first hour's introduction, planes were presented at the rate of two per day with reviews thrown in daily and before every examination. The image on the white screen measured 24" by 18" and was always centered so as to be in the same spot every day. Woe be unto the instructor that did not center the image. Every image on the

screen was exactly the same size, no matter what the size of the plane. A single engine plane had an image exactly as large as a four engine plane, so now one can see that size of a plane made no difference in air-craft identification. This was a serious mistake. A flyer can always tell in the air whether or not he sees a light or heavy bomber, or a fighter plane, but in class instruction every image was made the same size. The cadets often asked why the planes were the same on the screen, but instructors passed it off by stating that it was the "Army way" and that was the end. Since the C. O. of the ground school ran a small moving picture theater in Kentucky and never visited classrooms, the methods of instruction were not counted very important.

First Hour Lecture

During the first hour lecture, it was the procedure to place a slide in the projector and flash the image on the screen at the pace of $1/100$ of a second. The instructor had the class in the palm of his hand because the average cadet could not see the image and was afraid that he never would. It was always part of the lecture to talk about visual acuity, but never to explain to the cadet that by continual reviews of planes, he would acquire the ability to see all the image easily. In other words, the job of flashing slides became so mechanical, and the heat so terrific, that the instructor set up a defense mechanism for himself. The shutter could be set to operate from one second exposure to $1/100$ of a second, and many classes that should have been tested at $1/10$ of a second

were tested at almost any point from $1/25$ to $1/5$ of a second. During makeup examination, the time exposure played a very important part because cadets could always pass at $1/5$ but had a difficult time to pass at $1/10$ second rate. Many instructors never cleaned the reflector of the projector, so the image was not clear. However, on the whole, the instruction was well organized and carefully presented by most instructors.

When presenting a plane, the instructor allowed the image of the plane to stay on the screen while information as to name, engine type, horsepower, wing span, fuselage length, calibre of guns and number, bombload, rate of climb, and range was given to the class. All that the cadets had to remember was wing span, designation, and name. Here we find prospective airmen were made to remember wing span of American planes when they would never get them in their gun sights. Good old Army custom, once more.

First Three Lecture Hours

The first three hours were drawn-out affairs because only four planes were presented, and as a result, no long review could be held. After the fourth hour, one review would be held the first twenty minutes of the hour, and it would be increased to 35 minutes as the planes mounted in number. After the ninth hour the first examination would be held. Fourteen planes with repeat shots of some of the fourteen, making a total of eighteen images, were flashed on the screen at a speed of $1/5$ of a second. The results

of this examination were very good, merely because the speed of the time exposure was so slow. Many times several shots of silhouettes would be thrown on the screen during the exams, and these were the images missed. A cadet could easily recognize at slow speeds actual photographs of planes, but when presented with a head-on silhouette shot, would miss it. Let the reader ponder on this thought for just a minute. German and Japanese planes do not linger in the range of vision to allow the crew or pilot of an American plane to recognize theirs. The first B-17's were shot down because of a weakness in the nose. They had no chin turret. To make this attack, German planes had to come in head-on. Again a plane to attack must head in. But cadets continuously failed head-on shots, and because of this, very few such slides were shown in Pre-Flight. In other words, an effort was made to send on the next stage of training as many cadets as possible in the belief that weak cadets would fail in primary basic or advanced training.

The time of image exposure was shortened from $1/5$ to $1/10$ of a second from the eleventh hour of instruction on, and at this point real trouble began. A cadet was able after six or seven hours to see an image at $1/5$, but at $1/10$ of a second he would state that he saw only one engine or a single fin. While presenting a plane, the instructor would break down the image and point out engines, wing position, and tail assembly, not stressing one particular point but always giving three or four points of identification. Every tail assembly would be

broken down as to vertical fin and rudder and horizontal tail assembly. Wing position, wing tip, leading and trailing edge of wing, type of wing would be given. Engines, air-cooled or liquid cooled, position in wing whether it extended in front of wing or protruded in rear of wing, spinner or flat nose would be explained. It can be seen that every plane was dissected and torn down into small pieces. The object of this was that if the cadet saw any part of the plane, he should be able to identify it. However, cadets would see four engines in a single engine plane and one engine in a four engine plane. Two fins where only one exists; low wing for a high wing; spinner in the nose when engine was air-cooled, were some of confusing details that the cadets encountered.

In twenty hours, the number of planes presented numbered forty-five.

Cadet Failure

The twentieth hour examination covered thirty planes and this exam usually caused more failures than the other two. The reasons for these failures are several, but probably the most important was the fact that the eyes of the cadets were not as yet trained to catch the image. In order to train the eyes, an interesting procedure was carried on for some time and then discarded. This experiment consisted of flashing digits and various objects on the screen and then increasing the number to seven. At seven we stopped because at 1/10 of a second only about nine men out of seventy-five would get all seven. Also used, were slides that would give images

of steps, planes, oil-barrels, and coins. The cadet would have to identify and state the number of objects he saw. There were one or two men in each class who could name the objects and state the correct number. This type of instruction took up about ten minutes of the hour and came about twice a week. Although it did increase, by practice, the angle of vision, it was discarded by someone higher up as it was claimed it had no bearing on identification. Here again at least was a tool to aid the future airman to grasp an image instantly by actual training. Higher authorities considered neck exercises received in the physical training classes all that were needed. The twentieth hour failure by the cadet brought forth more excuses than any other hour, as he would claim that guard duty, charge of quarters, sick call, and dentist call had caused him to miss class periods and as a result he was not prepared. He saw very clearly the repetition of flash shots was the only way he ever could get a solid foundation, but no effort was made, when he had other duties to perform, to allow him to see the work he had missed. Cadets were given books that had pictures of both American and English planes. But the pictures were not authentic and as a result, after two years of work with them, the Training aids realized that the shots were none too good, so they were destroyed. Then we had a period for several months--three to be exact--that classes had no pictures at all to bring to their barracks for study and then a technical manual put in its appearance. The T. M.'s had been on the field for four months but were misplaced due to army inef-

ficiency and finally found at the Q. M. These manuals had pictures of all the planes of all nations. In many cases the pictures were not accurate, but they served the purpose. The Japanese planes caused the most trouble as very few good shots were to be had, so the cadets were given a collection of pictures of Japanese planes shot down. Some of these planes were damaged in the front but had good tail ends; others had damaged tail assemblies but good front ends. By the end of the twentieth hour, cadets were told that their eyes were now trained and no excuse could be offered. No account was taken of the fact that out of 80 or 90 men some eyes would take longer in training than others. Due to army standards, those that could not meet requirements at this point were washed out.

Reviews consisted of twenty to thirty planes at the start of each class period, and if an instructor stressed reviews as he should, the presentation of the two new planes a day suffered. The supply of slides was limited to about five photographs with silhouettes of each plane and it can readily be seen that cadets soon learned to recognize slides instead of planes. Meetings were held and over protest the senior instructor pulled out the hard slides and used only those that could be recognized easily. That simple shift ruined the program because planes in combat do not always present themselves in such a way as to be easily identified. During the writer's tour of duty at Maxwell Field, many meetings were held by higher authorities and finally the name of the course

was changed from air-craft recognition to Air-craft Identification but that did not help the cadet at all.

Twentieth To Twenty-Ninth Hour

From the end of the twentieth hour to the twenty-ninth hour, the cadet really learned to identify a plane merely because he had seen the same slides over and over again. The reviews continued and three class hours were devoted to reviews of planes alone, but these reviews were merely cramming sessions for the thirtieth hour exam. The cadet at this particular point had become trained. He would sit in his seat erect, and the instructor would say, "Ready" "Now" and click the shutter. The image always was at the same place on the screen and did not change position at all. So with attention and with eyes in the center of the spot where the image would appear, the student could not miss if his eyes were open. However, at this period the student believed that he was well grounded in recognition and would not try hard enough, and with the weather working against him, would fall asleep. Tours of walking were handed out and the same man would not sleep in a classroom again. The foundation of the course was repetition, continually using the same slides over and over again, so the cadet really learned the slides. The last exam was the easiest of all examinations, and those that had low marks in the twentieth hour usually brought their mark up with the thirtieth hour examination. A few head-on silhouettes were shown, but those used had a distinct identification feature, such as the P-47 with two exhaust gates shown on lower side of the nose.

Very few cadets failed in this exam because the shutter was accidentally adjusted at a slow speed and because of the length of time of the exposure, the cadet usually passed. If a cadet failed, he was given a chance and only one chance, according to regulations to make up the test. If, however, he received a mark below 70% in the makeup, he was washed out. However many cadets have taken two and three makeup examinations and finally passed because regulations were not adhered to by the registrar. The head office wanted to send as many men along as it could and usually ended up by sending them all with the exceptions of those very low and those that were court-martialled.

To sum up the so-called Flash System, all that one needed was a projector, time shutter to 1/100 of a second, slides, screen, shades, cadets, and "poop" sheets with an instructor to read the sheets and give information about planes to cadets. Main office would designate the number of times a cadet took a makeup, and instructors were continually battling to send in very few failures because it meant night work for makeup and the men would pass in the end anyway.

APPLICATIONS OF FLASH SYSTEM

The flash system with its time element and projector can be used in all grade schools for quick reviews particularly in arithmetic. In place of flash cards this system may be substituted to advantage. There would be much better attention in class and the focus point would be the screen. Outline of states, countries, and identification of diagram and pictures can be shown to advantage by the flash system. Its use in the teaching of characters of shorthand in high schools is also advocated. The flash system with its time element can be used for reviews in subjects such as arithmetic, spelling and stenography.

SHADOWGRAPH

The army has at Orlando, Florida, a school of applied tactics continuously seeking and testing all instruments of warfare. One division of that camp ran a refresher course for seven days. The major in charge of the refresher courses was a real estate man and a very "Eager Beaver". His contacts with hundreds of instructors were such that he was able to put out an idea or two every year and so in the spring of 1944 a new method of teaching air-craft identification was proposed. The old flash system was condemned and the new idea of shadowgraph proposed. It was put forth as the panacea for all the wrongs and ills of the flash system.

This system required a transparent screen four feet square and stood about three feet from the floor. Behind it was a light source placed ten feet from the screen. Wooden models of all planes were mounted on a four foot wire with handle so that they could be moved back and forth, up and down, and sidewise. The cadets remained in front of the transparent screen and the instructor to the side of the screen always hiding his model of the plane. Taking

the model and always being careful to hide it the instructor would tell the class that the plane was coming in at 12 o'clock and then bring it down rather fast. The plane could come in at any hour and leave the same way. Another arrangement was to mount two planes one in back of the other, on the same wire, and push them across the screen being always careful, according to A.A.F.S.A.T., to mount the enemy plane first so that the friendly plane appeared to be chasing it.

The whole idea of the shadowgraph was based upon the principle that the planes were moving and one could simulate the methods of attack by the angle in which the plane appeared on the screen to the cadet. However, only fighter planes could be used because medium and heavy bombers were too cumbersome to be used. Here again the same models would have to be used over and over again and the cadets would again learn the model and not the plane. When questioned about that, those in authority answered that the flash system was to be used at various times. Here again was the old story of buck-passing. An idea was given to someone higher up and he passed it along as his, but as he could not expand the principle, the instructor had to improvise.

It must be granted that the shadowgraph corrected one thing. It made the plane move and the cadet saw within his range of vision a moving object--the flash system gave a still picture, no motion. The sad part of the shadowgraph was that only about 1/3 of all planes presented were used.

Here again we marvel at the so-called army way--all of the planes could have been used if a track had been built behind a screen. The track had only to be a wire and on the planes several wire loops to hold the plane on the track. A spring could have furnished the motive power and two instructors used--one to set the plane in motion and one to catch it at the other end. This idea was put forth, but for some strange reason never used.

The shadowgraph was limited to small planes and required rooms of a depth of fifty feet because the set-up of machine and screen required all of a twelve foot depth. At Maxwell Field the classrooms could not use the set-up at all, but higher authority said in June, 1944 that it had to be done. Here was a situation that required about a week's work for carpenters merely to take out one partition between rooms, but it was too much for the C. O. of the pre-flight school, as he had to go through channels and when this writer left in November, 1944, nothing had been done to try out the idea. Since that time, all pre-flight schools have been consolidated at San Antonio, Texas, and from the latest reports the flash system is still being used.

APPLICATIONS OF SHADOWGRAPH

In this particular phase the uses of the silhouettes could be used. The only variation would be the moving of a silhouette across a transparent screen.

Rapid exposures of silhouettes could also advantageously be used to develop perception of the meaning of such terms as isosceles, equilateral, trapezoid, rhombus, etc. Such terms are often little more than a definition in the minds of pupils. The effective use of silhouettes would make such definitions really function in the geometric activities of pupils.

FILM STRIPS

At the time of this writing the pre-flight schools are using the flash system. The success or failure of air-craft identification is a good subject for argument. It must be granted that the prospective pilot is given an opportunity to see pictures of all types of planes, but while he is in the training stage, the aviation cadet never receives a chance to inspect even the American planes that he may see on the flight line. It is, of course, understandable when we consider that 200 or 300 aviation trainees can foul up any flight line by crowding around hitched planes. The English have gone to great lengths to produce films that contain actual air shots of both German and English planes. It can readily be seen that actual moving shots are of a greater help than still flash shots. Yet in the U. S. training program the only place that moving pictures are used is in hold-over groups. In order to fill in a class period for these cadets that are on shipping orders but waiting for vacancies at primary fields--the class period would be held in a theatre and a few actual combat shots would be given them.

It can not be argued that the expense of moving pictures was too great because money in the Army is as free as water. The only excuse that can be given is that Plans and Training were either too lazy or were satisfied with any condition. If everything flows smoothly, it will never be changed. Films are available because the writer saw film strips of Jap planes being thrown onto screens for air crews of the new B-29. Here enlisted men were drilled for hours on Jap planes coming in at all positions on the clock with the time range from 1/2 second to three seconds. The argument put forth here is that the time element of the B-29 is around a 12 hour period and that there is no cover, so all that the crew members see will be Jap planes. Cadets back from combat zones have said that only after 10 missions were they really able to spot enemy planes. In other words, even though they had been subject to intensive air-craft identification training, they had forgotten most of it. It is a well established fact that all friendly planes were well painted so as to be easily recognized for the "D" day invasion.

USE OF FILM STRIPS IN THE PUBLIC SCHOOL SYSTEMS

The armed forces have found that the most effective method for making learning easier for cadets is the visual aid system of charts, models, slides and use of filmstrips. That the public school systems use the filmstrip to a limited degree, is due mainly to lack of money and equipment. A well rounded science program cannot be complete unless the field use of a projector is maintained. The films that are used in science programs have been designed to be used at the time in the course when they will help the instructor to standardize operations and make ideas clear to the students. They are not made to be shown as separate, uncorrelated features. And when planned for one specific group as is most often the case, they are not expected to meet the complete needs of another group being taught things in a different way. It must be remembered that when instructors first use visual aids--the aids will not do the complete job for them. The aid, such as the film, will only do its job. The film is the instructor's assistant, not his substitute and not his master. The instructor can show, in large scale, machinery parts,

physical and mechanical processes which are otherwise minute and hidden. By the use of films the instructor can bring into his classroom operations and activities which are too remote, too complicated, or too rapid to present to his students any other way. This can only be done when the film is tailor-made for a specific purpose.

It was in industry rather than in the schools that the training films had their trial by fire. Such nationwide companies as those in the automotive industry had for years used these media for training their widely scattered personnel in understanding and repairing of the annually changed engines, chassis, and bodies of their cars. Oil companies, roofing concerns, machine tool companies, the tractor industry all had proved the efficacy of visual aids in clarifying their training processes and standardizing their instructions of salesmen and operatives. Their programs had taught them the hard lesson that when exposition of theory stood in the way of true and speedy instruction in operative processes, the former had to go. The direct training job could be, and was done; slide films and motion pictures could and did aid in the process.

A few instructors forget at times that the obvious purpose of films is merely to help them not to supplant them. Some instructors feel that films take up too much class time, though from the army program, the evidence is clear that on the contrary, pictures shorten the time required to master the subject. Films are not to be used as

a means of entertainment but as teaching aids. The slide film and motion picture film have two objectives: To enable the learner to see what is being done that is effective, and what was being done that was wrong.

The use of slide films in the public school system should follow five separate steps.

1. Preparation stage

The instructor must be familiar with the content of the film which he is to use for his class period; he must learn the phase of the subject matter which the film covers and the manner in which it treats that subject.

2. Presentation

The instructor prepares his students for viewing the film by brief introductory remarks which state what the film is about and why it is being shown. Emphasis is given to various aspects of the subject as presented by the film. This warning keeps a class alert.

3. Application stage

Many of the manufacturing processes will never be seen by students, but by having the finished product in the classroom, the student can see tangible evidence of completed processes.

4. Examination

The slide film should be followed by a short examination to see just what the student has grasped.

5. Discussion period

At this period the instructor can close up any gaps in the student's mind.

The use of slide films and motion pictures by the Armed Forces is concrete evidence that much more of this type of learning is needed in the public school systems. The use of the films speeds up the time required both to teach and to learn certain subjects and insures a quality of teaching and learning that is most desirable. Though the use of the flash system of instruction used in aircraft identification has apparently no especial place in the school systems, the experience of teaching with slide films and motion picture films in the army proves conclusively that we need more of this type of learning in the public school systems.

OPERATION OF SCHOOL

The reader of this paper by now has some idea of the methods used to instruct airmen in air-craft identification; therefore a few facts on the physical set-up of the school itself might be of interest. The Commanding Officer of the Field is, of course, in full charge and is the responsible person. Under the C. O., is a Director of the Ground School and directly responsible to the Director is an Assistant Director. At Maxwell Field, the Assistant Director was a former school teacher who had been a reserve officer, but the assistant director for the past ten years had been a hotel clerk. The instructors for the various departments were in charge of a senior instructor. This senior instructor had an assistant --the assistant did all the work. Each department had its own offices. Only at four o'clock in the afternoon would an instructor know where and what classes he was to teach. The schedule would be posted every day but only at the last minute. Classes would start anywhere from 6 A.M. and be over at 5 P.M. The corps was divided into two wings of about 6000 men each. Wing I would be the upper class for

5 weeks and Wing II the lower class and then the procedure would be reversed. One wing attended class in the morning and the other wing in the afternoon. The cadets ranging in age from 19 to 26 years of age received instruction in navigation, naval identification, maps and charts, and, of course, military subjects. Usually each cadet had a load of 4 hours of academic work per day. The younger cadets had little or no trouble with the subject matter, but the older ones were troubled and they would be the washouts.

Each instructor handled about 75 men; the rooms would seat about 81. Strict military procedure was followed at all times--chewing gum, talking in attention, sleeping were forbidden--and punishment tours were handed out freely for infraction of rules. An instructor would stay with one flight for several weeks and then for no reason his hours would change and he would have another group. Although the plans and training officer knew the number of cadets, subjects to be taught, rooms available, he could never make out the same schedule from one week to the next the same. All he needed was a master chart and he could have followed it from month to month--but not that man! He would send code classes where A. I. classes should be, and Math classes to Physics labs. His system was one of the great mysteries to the instructors and we could never get an answer. All that we knew was that he had run a gas station down in southern Alabama and received his "gentleman's certificate" through the C. O. of the field. As long as one was in the

ground school he could be switched to any class whether he knew the subject or not. Sometimes classes would be held to teach instructors but usually not. Teachers were of all types--most of them below 38 and very much pleased that they were teaching--not fighting. Many had not seen a classroom since they had been in high school, but they were teachers, nevertheless. The C. O. of the Field would never visit the classroom nor would the director. They would make a spot check inspection that consisted of riding around the area in a staff car to see if any paper, etc. littered the area.

An inspection board would visit each instructor at least once a week and rate him accordingly. Every officer has an efficiency rating which is filed in his personal file that accompanies him on every change of station. The human element entered into the inspection department and "polishing the apple" always took place with the inspector so that the polisher would receive a high rating. At Maxwell Field one of the inspectors continually argued with several instructors and as a result the instructors' ratings suffered. Heads of the departments or senior instructors also inspected, and in the case of one department head, many of his instructors out-ranked him and since he was looking for a promotion, his rating of officers was none too fair. The assistant director of the ground school also rated instructors. He had the final word on the ratings. As he never visited any classrooms, he could not honestly and fairly rate a man, yet he passed in the ratings every three months.

The instructor could not bring forth new ideas because they would conflict with the directive of the Eastern Flying Training Command. This directive told each man just what he could say and how to say it. There could be no comment unless it was official. The instructor's personal thoughts on any matter were out--he could not express an honest opinion. He could not say that one American plane was better than another though he had facts to bear out his case. If he made any comment of this nature he would receive a letter from the C. O. asking for an explanation.

CONCLUSION

The Air Force has been in active combat for over three years and our ratio for losses is much less than either the Germans or the Japs; therefore, it seems correct so assume that our methods of preparation for combating the enemy are better than theirs. With that thought in mind it would seem that criticism of any kind is out of place. However if we had at the outset used the method of the English, that is, the use of film to instruct in air-craft identification our early losses would have been cut down, and today a pilot observer or gunner would not need to take chances on ten missions before he actually can identify planes. Strips were available because instructors previewed them all the time, but they were all English planes. The English had pictures of German planes that the instructors saw, but the aviation cadet never was given a chance to look at them. This was argued out time and again and we all argued that the English films answered all problems but higher authority never agreed with the officers of the ground school. The film strip was the answer, but we never did receive the correct solution in the ground school.

GLOSSARY OF ARMY TERMS

A.A.F.S.A.T.	Army Air Force School of Applied Tactics
Flight	Formation of 65 Cadets
Gadget	Aviation cadet
Goofing Off	Deviating from directive
Greenhouse	Cockpit of a plane
Polishing the Apple	Seeking favor from higher authority
Poop Sheets	Lesson plan that each instructor had to follow
Soap	Facts of interest obtained from intelligence reports
Washed Out	Dropped from the cadet training program due to academic failure or court-martial
Wing	Cadet section used to distinguish upper and lower classmen
Tours	Punishment detail usually consisting of walking with full equipment

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